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THE INTERNATIONAL TRANSMISSION OF SHOCKS: FOREIGN BANK BRANCHES IN HONG KONG DURING CRISES

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The International Transmission of Shocks:
Foreign Bank Branches in Hong Kong during Crises*

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Abstract

The international transmission of shocks in the global financial system has always been an important issue for policy makers. Different types of foreign shocks have different effects and policy implications. In this paper, we examine the effects of the recent U.S. financial crisis and the European sovereign debt crisis on foreign bank branches in Hong Kong. Unlike the literature on global banking that studies a global bank's foreign operations from a home country perspective, our analysis uses foreign bank branches in Hong Kong and has a distinct host country perspective, which is more relevant to the host country policy makers. We find that global banks use their foreign branches in Hong Kong as a funding source during a liquidity crunch in the home country, suggesting that global banks manage their liquidity risk globally. After the central bank in the home country introduced a liquidity facility to relieve funding pressure, this effect disappeared. We also find strong evidence that foreign branches of banks in the crisis countries lend significantly less in Hong Kong relative to a control group, suggesting the presence of a lending channel in the transmission of shocks from the home country to the host country.

1.   Introduction and Motivation

The transmission of shocks in the global financial system has always been an important topic in international finance. With the globalization of financial markets and increasing capital flows across countries, the channels and the magnitude of transmission of shocks are evolving over time. In this paper, we are interested in understanding how two recent shocks in advanced foreign economies, namely, the 2007-09 U.S. financial crisis and the 2010-11 euro area sovereign debt crisis, were transmitted to Hong Kong through the crisis country's foreign banking organizations operating in Hong Kong. Specifically, we are interested in learning how a liquidity shock in the home country of a global bank affects the liquidity management of its branch in the host country. And perhaps more importantly, we investigate whether the home-country shock could ultimately affect the foreign bank branch's lending activities in the host country, thereby having real effects on the host country's economy to the extent that there may not be good substitute for their credit provisions.

As an international financial center, Hong Kong has a large number (about 130) of foreign banking operations. A large majority of these foreign banking affiliates are established as branches of foreign banks. In 2013, 44 of the top 50 global banking organizations had established a foreign branch in Hong Kong. These foreign banking operations vary by size, complexity, and scope of activities. Some of them are active in both funding and lending activities, gathering local deposits to provide loans to local borrowers. Others tend to rely more heavily on either lending or funding in the local market, depending on the global bank's business model.[1] As such, the asset and liability management of foreign bank affiliates in Hong Kong varies quite considerably, providing a rich empirical setting to study how foreign banking operations respond to shocks in a small open economy.

Our empirical strategy is to identify a number of fairly well-defined financial shocks in advanced foreign economies, including the 2007-09 U.S. financial crisis and the 2010-11 euro area sovereign debt crisis, that could potentially affect a global bank's foreign operation. Using confidential supervisory information of foreign banking organizations in Hong Kong collected by the Hong Kong Monetary Authority, we study the liquidity management and lending activities of global banks' foreign branches in Hong Kong when their parent bank experiences a significant financial shock using event study methodology.

There is a growing literature on how global banks manage their liquidity worldwide. For example, Cetorelli and Goldberg (2012) study the liquidity management of U.S. global banks from the perspective of the parent company. They find that funds regularly flow between parent banks and their foreign affiliates in diverse foreign markets; and further show that parent banks experiencing funding shocks tend to reallocate liquidity according to a location-related pecking order, which depends on the relative importance of the foreign affiliates' contributions to their parent companies'

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[1]   Please see Box 6 "Changing business models of Hong Kong branches of US and European global banks" (pages 81-84) in HKMA (2013) for a description of business models of Hong Kong branches of US and European global banks.

revenue stream. Rather than focusing on the parent companies of a few global banks, our approach is to study the liquidity management of a cross section of foreign banks in Hong Kong whose parents are from different foreign countries. Our research design therefore encompasses a wide range of foreign banks, which differ considerably in the scale of foreign operations. More importantly, assuming the shocks in the home country to be exogenous to Hong Kong, this provides a natural experiment setting to isolate the treatment effects on foreign banks from a host country's perspective.

The host country is expected to have a vested interest in the effects of foreign shocks on foreign banks' activities in its jurisdiction, including both funding and lending activities in the local banking markets, as well as their safety and soundness. The evidence of the bank lending channel (see for example Kashyap, Stein and Wilcox 1993, Peek and Rosengren 1997, Kashyap and Stein 2000, Paravisini 2008, Khwaja and Mian 2008) suggests it has real effects on the economy, although quantifying the magnitude of the economic effect may be challenging. Nevertheless, it does not seem unreasonable for the host country policy makers to lean against the possibility of an adverse macroeconomic shock stemming from a foreign source but transmitted through the foreign branch channel. In a similar spirit, applying the Basel liquidity requirements, including the liquidity coverage ratio and the stable funding ratio, at the foreign branch level, could help the host country banking supervisor to protect its banking system from foreign shocks.

The rest of the paper is organized as the following. In the next section, we briefly describe the foreign banking organizations that have a significant presence in Hong Kong. Section 3 outlines the key developments during the U.S. financial crisis and the European sovereign debt crisis that determine the event dates in the study. The methodology and data are discussed in Section 4. Section 5 reports the empirical findings and Section 6 concludes.

2. Foreign Banking Organizations in Hong Kong

Hong Kong is a small open economy; its 2013 GDP was US$ 274 billion, less than 2 percent of the U.S. GDP in that year. Despite its small size, 44 of the 50 largest global banks (in terms of consolidated total assets) operated in Hong Kong by having bank branches at the end of 2013. The high concentration of foreign banks in Hong Kong reflects its role as a major international financial center in Asia. Hong Kong has no restrictions on capital flows. The Hong Kong dollar is officially linked to the US dollar through a currency board mechanism, so the exchange rate risk with respect to the US dollar is expected to be small.

In addition to providing banking services to customers in Hong Kong, foreign banking organizations also rely on Hong Kong as an important funding source. The cross-border banking funds by the Hong Kong banking sector, on a net basis, rose rapidly before the 2007-09 financial crisis and peaked at US$222 billion in October 2007; and these cross-border funding flows were driven largely by intra-firm funding flows of globally active bank branches in Hong Kong (HKMA 2014).

Wong, Tsang, and Kong (2014) provided evidence that during the financial crisis, global banks reacted to a parent-bank funding shock by repatriating funds from their Hong Kong branches through their internal capital market, and thereby transmitting global banks' liquidity shock from the home to the host country. We follow a similar line of inquiry, using a different methodology. Moreover, in addition to studying the 2007-09 U.S. financial crisis on Hong Kong foreign bank branches, we also examine the shock arising from the 2010-11 euro area sovereign debt crisis. Furthermore, we investigate the effects of the crises on foreign bank lending in Hong Kong.

3.   Two Recent Financial Shocks

Both the 2007-09 financial crisis in the U.S. and the 2010-11 sovereign debt crisis in the euro area are well documented.[2] Both the U.S. and the euro area have a number of global banks that have foreign branches in Hong Kong. Our research design is to treat these two financial shocks as natural experiments, and to examine whether foreign branches whose parents are from the U.S. (euro area) behaved differently in Hong Kong. The two responses by foreign bank branches that we focus in this paper include: (1) the liquidity effect, and (2) the lending effect.

Both the U.S. financial crisis and the euro area sovereign debt crisis sent shock waves across the globe. They are sometimes referred to as global financial crises, pulling down economic growth around the world and dislocating markets in major financial centers. Needless to say, both GDP in Hong Kong and the financial markets took a hit during the crisis. It is therefore important to distinguish the treatment effect, that is, foreign banks from crisis countries, from the systematic effect that affects all foreign banks. The difference-in-difference approach is well suited for this kind of inquiry.

In the following two subsections, we briefly chronicle the onset and development of the two financial crises, including the associated policy responses by the Federal Reserve and the European Central Bank. Rather than laying out all the twists and turns of the financial crisis, we highlight certain important developments that allow us to define the event dates in our empirical analysis.

3.1   2007-09 U.S. Financial Crisis

A prominent feature of the 2007-09 financial crisis that is relevant to this paper is the severe dislocation it caused in key financial markets that resulted in the seizing up of the interbank funding market. Figure 1 shows the spread between the 3-month London interbank offered rate (LIBOR) and the overnight indexed swap (OIS) rate, which reflects expectations of the overnight federal funds rate over the same 3-month period, from 2005 to 2013. This spread measures the risk premium that banks in the Libor panel face in borrowing 3-month term funds rather than overnight.

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[2]   See for example, Financial Crisis Inquiry Commission (2011), and Gorton and Metrick (2012) and the references therein for the 2007-09 financial crisis in the U.S., and Lane (2012) and the references therein for the euro area sovereign debt crisis.

Before the financial crisis, the Libor-OIS spread was negligible, implying that banks paid a very small premium in borrowing term funds versus overnight funds. When the run on the wholesale funding market started in August 2007, the Libor-OIS spread spiked up.[3] In response, shortly after the Federal Reserve's policy making body, the Federal Open Market Committee (FOMC) concluded their scheduled meeting on August 7, the Federal Reserve announced on August 10 that it was providing liquidity to facilitate the orderly functioning of financial markets.

While the liquidity injection by the Federal Reserve prevented the funding market from deteriorating, it did not arrest the skittishness in the market. Towards the end of 2007, the dislocation in the short-term funding market worsened, perhaps due to heighted demand for term funds around year-end when banks prepare for their year-end financial statements. On December 17, 2007, the Federal Reserve, along with four other foreign central banks in Canada, the U.K., the euro area, and Switzerland responded to the liquidity shock by announcing a number of extraordinary measures designed to address elevated pressures in short-term funding markets. In the U.S., the Federal Reserve started auctioning term funds to depository institutions under the Term Auction Facility (TAF). To meet the dollar shortage overseas, the FOMC authorized temporary swap lines with the European Central Bank and the Swiss National Bank.

The introduction of TAF provided much needed temporary relief to the interbank funding market, and the Libor-OIS spread eased somewhat in early 2008. However, large financial institutions in the U.S., especially broker-dealers which relied heavily on wholesale funding, remained under intense pressure. The financial markets weathered the forced sale of Bear Sterns in March 2008 reasonably well. In early September, the placement of both Fannie Mae and Freddie Mac into conservatorship by the U.S. Treasury pushed the financial system closer to the edge.

On September 15, Lehman Brothers filed for bankruptcy. Not only did financial markets plummet but credit markets seized up. (The spike in the Libor-OIS spread, while unprecedented, might also reflect few transactions taking place in the funding market.) Due to the interconnectedness of large financial institutions, as well as their common exposure, the solvency of many large financial firms was in doubt. Merrill Lynch, another large broker-dealer, announced on September 15 that it was being acquired by Bank of America. AIG received emergency liquidity assistance from the Federal Reserve on September 16. The Washington Mutual Bank was closed by its regulators, and announced on September 25 that it was being acquired by JP Morgan Chase. Wachovia announced on October 3 that it was being acquired by Wells Fargo.

The widespread uncertainty about the solvency and soundness of many banks in the U.S., including the very large ones, essentially drove information asymmetry in credit markets to extreme levels so that the market failed. Indeed, Flannery, Kwan, and Nimalendran (2013) reported that their measures

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[3] Although the run on the wholesale funding market began in August 2007, the buildup of financial excesses, including the credit boom, rising house prices, expansion of wholesale funding in the so called shadow banking system, had been happening over a number of years before the crisis. What triggered the run seemed to be the failure of a number of subprime mortgage originators in the first half of 2007, and the rapid deterioration in subprime-related security prices.

of opacity in large banking firms using market microstructure data skyrocketed. As long as concerns about the solvency of large financial institutions remained in question, the interbank market was unsettled and illiquid. While the Libor-OIS spread continued to be elevated, it was unclear how much transaction volume took place at those rates. It seems quite conceivable that the demand for liquidity by banks reached the highest point during this crisis (Gale and Yorulmazer 2009).

To improve liquidity in the credit market, it became apparent that policy makers had to resolve the root cause of the credit market failure: information asymmetry between borrowers and lenders. In an effort to assist the public's understanding of the health of financial institutions, the Federal Reserve, joint with other federal banking regulators, conducted the Supervisory Capital Assessment Program (SCAP) on 19 of the largest banking firms in late 2008, and publicly announced the SCAP results in May 2009. The release of the SCAP findings, in conjunction with the mandatory recapitalization program, effectively reduced the opacity of large financial firms and restored public confidence about their solvency. Soon afterward, the interbank funding market returned to normal.

3.2   2010-11 Eurozone Sovereign Debt Crisis

With hind sight, the creation of the monetary union among the eurozone countries without a banking union or the fiscal union sowed the seed of fiscal and/or financial imbalances that eventually led to the sovereign debt crisis. Shambaugh (2012) and Lane (2012) provide a good overview of the euro's broader economic crisis. For the purpose of this paper, the relevant part of the euro area sovereign debt crisis is that it also evolved into a banking crisis, due to banks' exposures to both the public and the private sectors.

Figure 2 shows the 5-year Credit Default Swap spreads on the sovereign debt of six countries in the euro zone. This measure of default risk on Greece sovereign debt moved up in late 2009, as market participants started to focus on the slowing economy and fiscal imbalances. Rising default risk in sovereign debt quickly spread to other euro zone countries, including Portugal, Ireland, Spain, and Italy, which all had very bad economic fundamentals.

The sovereign debt crisis exposed the weakness of the banking system in crisis countries. More importantly, it also raised doubt about the soundness of banks in non-crisis countries due to opacity in their exposure. Figure 3 shows the 3-month euribor-eonia spread, which is a measure of the risk premium European banks faced in borrowing term funds versus overnight funds. Similar to the financial crisis in the U.S., at the height of the European sovereign debt crisis, the interbank market failed.

To ease liquidity problems in the euro area, the European Central Bank announced on December 8, 2011 that it was to conduct two three-year long-term refinancing operations (LTROs), one in December 2011 and the other in February 2012. The two LTROs totaled about 1.1 trillion euros. While strong demand reflected genuine funding needs by banks, the ECB estimated excess liquidity

reached exceptionally high levels, suggesting that euro area banks were accumulating sizable precautionary liquidity buffers.[4] With improving market conditions in the later part of 2012, the demand for excess liquidity declined and banks started repayment of the LTROs; the euribor-eonia spread also receded to its normal level. By late 2013, banks had repaid about 40 percent of their initial LTRO borrowings.

4.   Methodology and Data

To test the effects of home country shocks on foreign bank branches in Hong Kong, controlling for systematic changes in the economic environment in the host country, we use the difference-in-difference approach that can be broadly described by the following regression:

$$\Delta Y_{it} = \alpha_t + \beta_t (Shock_{it}) + \varepsilon_{it}, \tag{1}$$

where

ΔY_{it} is the change in certain activities of interest of the ith foreign bank branch in Hong Kong before and after the $Shock_{it}$ in country j,

$Shock_{it}$ equals one if the ith foreign bank branch's parent company is from country j and zero otherwise.

In equation (1), the intercept term α_t measures the systematic change in Y for all foreign banks in Hong Kong before and after the foreign shock during time t. Thus, the effects of any change in local economic conditions in Hong Kong, including the transmission of the foreign shock to the Hong Kong economy through other international linkages, should be absorbed by the intercept term α_t. The coefficient β_t tests whether a foreign bank branch in Hong Kong whose home country experiences a shock behaves significantly differently with regard to Y relative to other foreign branches in Hong Kong. Finding a significant coefficient of β_t would provide evidence that the home country shock is transmitted to the host country through the foreign branch channel, above and beyond other broad transmission channels.

Regarding the banking activities Y that we are interested in examining, they fall into four main categories: the holding of liquid assets, the amount of internal lending to/borrowing from the parent company, the amount of external lending to borrowers inside/outside Hong Kong, and the gathering of retail and wholesale deposits. Specifically, Y includes:

> Liquid assets = the weighted amount of liquefiable assets as defined in the *return of liquidity position* reported by foreign bank branches in Hong Kong to the Hong Kong Monetary Authority;

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[4]   See European Central Bank Monthly Bulletin in January 2014.

Net Due = due from overseas offices – due to overseas offices;

Loans = total loans and advances to customers[5];

Loans for use in Hong Kong = loans and advances to customers for use in Hong Kong[6];

Loans for use outside Hong Kong = Loans minus Loans for use in Hong Kong;

Retail Deposits = total deposits from customers;

Wholesale Deposits = total balances due to banks;

Total Assets

We obtain foreign branch level data from the monthly return of assets and liabilities and the return of liquidity position that foreign bank branches in Hong Kong are required to report to the Hong Kong Monetary Authority. Table 1 provides descriptive statistics for 89 foreign branches in Hong Kong from 8 geographical areas, from 2004 to 2012.[7]

Monthly averages of Y are computed for each foreign branch over the following periods according to the unfolding of the 2007-09 U.S. financial crisis and the 2010-2011 euro zone sovereign debt crisis (shown by the grey bars in Figure 1):

Period 1: 2006:7 to 2007:6 (pre-US financial crisis)

Period 2: 2007:7 to 2007:11 (pre-TAF)

Period 3: 2008:1 to 2008:6 (post-TAF, pre-Lehman bankruptcy)

Period 4: 2008:9 to 2008:12 (post-Lehman bankruptcy)

Period 5: 2009:10 to 2010:3 (pre-euro zone debt crisis)

Period 6: 2011:7 to 2011:9 (pre-LTRO)

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[5]   Interbank bank loans are not included.

[6]   A loan is regarded as for use in Hong Kong if it finances or has a direct impact on the level of economic activity in Hong Kong. For most of the cases, this is determined by whether the loan is made available or disbursed in Hong Kong and by the principal place of business of the customer.

[7]   Branches of Chinese banks in Hong Kong are excluded from our sample because Hong Kong belongs to China so these branches are not foreign.

Period 7: 2012:3 to 2012:12 (post-LTRO)

To compute the growth rate between two periods, we take the percentage change in Y from period n to period m, where Y is the monthly average over the respective periods. When Y is expressed as a ratio, such as loans-to-assets, we compute the change in percentage points in Y from period n to period m, where Y is the monthly average of the ratio over the respective periods. In the case of Net Due, which can be positive or negative, we only compute the percentage point change in Net Due to Total Assets between two periods.

Because the U.S. financial crisis evolved over several phases, we first examine the change in Y between two adjacent periods to study the effects of the shock on an incremental basis. Depending on the magnitude and the transmission of the shock, the difference-in-difference may not be easy to detect statistically. However, narrowing the period-by-period comparison would allow us to pin down the nature and the effects of the shock more precisely. For a more powerful test, we also examine the difference between period 5 and period 1 that captures the cumulative effects of the U.S. financial shock.

5.   Results

Before fitting equation (1) using the foreign branch data, we eliminate the outliers in our sample by dropping those observations with ΔY exceeding the 95th percentile or less than the 5th percentile.[8] Equation (1) is then fitted using Ordinary Least Square.

5.1   U.S. Financial Crisis

Table 2 reports the effects of the onset of the US financial crisis on foreign bank branches in Hong Kong. ΔY is the change in the monthly average over the pre-TAF period from the monthly average over the pre-financial crisis period. Shock equals one if the foreign bank branch's parent is headquartered in the U.S., and zero otherwise. For each of the Y variables except the variable Net Due, we compute both the percentage change in Y, and the change in the ratio of Y to total assets; for the variable Net Due, we compute only the change in the ratio of Net Due to total assets. At the onset of the US financial crisis, foreign bank branches in Hong Kong raised their holding of liquid assets significantly. However, because their total assets also expanded, the ratio of liquid assets to total assets actually declined. On the other hand, foreign branches of US banks holding of liquid assets declined, and the coefficient of Shock is statistically significant. Since the change in their liquid-asset-to-total-asset ratio was not significantly different from non-U.S. foreign branches, their total assets must have shrunk.

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[8]   These outliers could be results of *de novo* branches, mergers and acquisitions, or revocations of branch operations. For robustness, estimation using a 90% winsorization of data provides qualitatively similar results.

At the same time, foreign branches' net lending to their parent company (i.e. Net Due), as a ratio to total assets, declined significantly; but the foreign branches of US banks increased their internal lending to their parent, and the difference is statistically significant. These results suggest that at the onset of the US financial crisis, the foreign branches of US banks in Hong Kong served as an important offshore funding source for their parent company through the firms' internal capital market. This observation is consistent with the evidence in the foreign exchange swap market found by Hui et al. (2011) that Hong Kong became an alternative dollar funding source as borrowing in other markets became more difficult during the crisis period. It is also important to notice that foreign branches of US banks upstream funds to their parents mainly by running down their liquid assets; the change in their loans outstanding and deposits was insignificantly different from other non-US foreign branches.

Table 3 reports the effects of TAF on foreign branches in Hong Kong by comparing the changes from the pre-TAF period to the post-TAF, pre-Lehman bankruptcy period. Again, the variable Shock equals one if the foreign bank branch's parent is headquartered in the U.S., and zero otherwise. After the Federal Reserve introduced the TAF to relieve funding pressure in the US interbank market, the results in Table 2 disappear. Foreign branches of US banks in Hong Kong raised their holding of liquid assets significantly, but at a rate that was no different from other foreign branches. Foreign branches in Hong Kong continued to shrink their net lending to the parent company, but there was no significant difference between foreign branches from the US versus other foreign branches. The results suggest that the introduction of TAF effectively stopped the upstreaming of funds from US banks' Hong Kong branches to their parent; foreign branches in Hong Kong, including those originated from the U.S., increased their holding of liquid assets and significantly reduced their internal lending to parent. Foreign branches in Hong Kong expanded their loans outstanding further, funded by raising deposits locally; but there was no significant difference between US and non-US foreign branches.

Table 4 reports the effects of the Lehman Brothers bankruptcy on foreign branches in Hong Kong by comparing the changes before and after the Lehman bankruptcy. The results suggest a modest effect. Foreign branches in Hong Kong expanded their loans outstanding, which is consistent with borrowers in Hong Kong drawing down their lines of credit as a precaution against illiquidity as in Ivashina and Scharfstein (2010); they funded those new loans by raising deposits, and mainly wholesale deposits. There were signs of foreign branches increasing their holding of liquid assets and reducing their internal lending to parent, but the coefficients are not statistical significant. The findings in Table 4 do not reveal any significant differences between foreign branches of US banks and non-US banks in Hong Kong immediately following the aftermath of the Lehman bankruptcy, despite the chaos in financial markets.

With a rather narrow event window, the results in Table 2 to 4 show the different effects of the onset of the financial crisis, the introduction of TAF, and the bankruptcy of Lehman on US and non-US foreign bank branches in Hong Kong, separately for each episode. In Table 5, we examine the cumulative effect of the US financial crisis on foreign branches by comparing the changes before the

onset of the crisis (period 1) and the period after the Lehman bankruptcy had been largely absorbed by the market (period 5). On net, foreign branches in Hong Kong significantly increased their holding of liquid assets, in line with their asset expansion, so that the ratio of liquid assets to total assets did not change significantly. However, internal lending to the parent company, as a ratio to total assets, declined significantly. Although the coefficients for the US Shock suggest a smaller response in liquid assets and internal lending to the parent than their non-US counterparts, they are not statistically significant.

However, the cumulative effects of the US financial crisis on US foreign branches lending and deposits in Hong Kong were significantly different than for non-US foreign branches. While foreign branches increased their lending in Hong Kong significantly, US foreign branches lent significantly less.[9] Regarding deposits, both retail and wholesale deposits rose significantly in foreign branches in Hong Kong. While US foreign branches retail deposits rose significantly faster than non-US branches, their wholesale deposits rose relatively less rapidly but the difference was not significant.

5.2   European Sovereign Debt Crisis

Table 6 reports the effects of the European sovereign debt crisis on foreign branches in Hong Kong, before the introduction of the long-term refinancing operation by the European Central Bank. In these regressions, Shock equals one if the foreign bank branch's parent is headquartered in the euro area, and zero otherwise. From period 5 to period 6, foreign branches holding of liquid assets increased significantly, but the ratio of liquid-assets-to-total assets dropped significantly, due to their rapid expansion in total assets. While the changes in liquid assets for foreign branches from the euro area rose less rapidly, the difference is not significant. The differences in the change in the liquid-assets-to-total-assets ratio, and the Net-due-to-total-assets ratio, between European foreign branches and non-European foreign branches are insignificant.

However, the differences in both lending and deposit activity between European and non-European branches in Hong Kong are significant. While non-European foreign branches expanded their lending in Hong Kong significantly, European branches lent significantly less. This finding is robust when total loans are decomposed into loans for use in Hong Kong and loans for use outside Hong Kong.[10] At the same time, non-European branches expanded their retail and wholesale deposit gathering significantly, while European branches expanded significantly less. [11]

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[9]   The US banks experienced a decline in their market share in Hong Kong's syndicated loan market during the global financial crisis, which dropped from 8% in 2006 to 2% in 2008. Statistics of the syndicated loan market in this paper are from Bloomberg and *Basis Points*.

[10]   The market share of credit extended by European branches in Hong Kong's syndicated loan market declined from 29% during 2007-2009 to 15% in 2011 and 16% in 2012.

[11]   Non-European branches expanded their wholesale deposits much more rapidly than retail deposits, resulting in a significant drop (increase) in the retail deposits (wholesale deposits) to total assets ratio. This was not the case for European branches.

Table 7 reports the effects of the LTROs on foreign branches by examining the growth from period 6 to period 7. Non-European branches raised their holding of liquid assets significantly, again in line with their growth in total assets, so that the ratio of liquid assets to total assets was virtually unchanged. European branches, on the other hand, shrunk their holdings of liquid assets as their total assets declined, which resulted in little change in the ratio of liquid assets to total assets also.

Despite the two LTROs by the ECB, European branches in Hong Kong contracted while non-European foreign branches expanded, as evidenced by the regression of the growth in total assets. While total loans in foreign branches continued to expand, loans by European foreign branches expanded significantly slower. Among European branches, loans for use in Hong Kong actually declined; loans for use in Hong Kong grew significantly among non-European branches. Loans for use outside Hong Kong grew even faster among non-European branches, but not as fast among European branches although the difference was not significant. As a result, European branches' share of Hong Kong's total loans and advances shrank to about 4.5% at the end of 2012, down from 9.0% at the end of 2006.[12] Wholesale deposits in European branches, in both levels terms and as a ratio to total assets, declined significantly; this seems consistent with the LTROs relieving funding pressure faced by European banks.

6.   Conclusions

In this paper, we exploit the U.S. financial crisis and the European sovereign debt crisis to examine how shocks in a home country affect their foreign branches in a host country (Hong Kong) using non-crisis countries foreign branches as controls. By employing the difference-in-difference method, we can effectively purge the demand-side factors to uncover the supply-side effects. By choosing a narrow event window, we can zoom in on the effects of certain aspects of the financial crisis, as well as the policy responses. We also examine the cumulative effect of the U.S. financial crisis on Hong Kong's foreign bank branches.

Overall, we do not find much evidence of liquidity hoarding by foreign bank branches either at the onset or during the financial crises. This suggest that illiquidity in the home country does not transmit to the host country. On the other hand, we find evidence of US branches in Hong Kong upstreaming funds to their parent company at the onset of the crisis, consistent with the operation of an internal capital market by global banks. This effect disappears after the introduction of TAF by the Federal Reserve, which was designed to relieve the pressure in the US interbank market.

We find strong evidence that foreign branches from crisis countries lend significantly less than foreign branches from non-crisis countries. This is robust with respect to the U.S. financial crisis and the European sovereign debt crisis. Thus, the vulnerability of the parent bank in the crisis country, including the potential capital shortfall, appears to have significant effects on global banks' lending

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[12]   Authors' calculation.

activities in the host country.[13] This could have adverse effects on the host country's economy to the extent that there might not be close substitutes for foreign banks' credit services. While the supply of short-tenor loans was filled by domestic banks and other Asian banks, there was a general decline in long-tenor loans. The shortage of long-term finance may have filtered through to the cost of borrowing.[14]

Finally, the liquidity intervention by central banks, TAF and LTROs, might have relieved some of the funding pressure in the home country, which ultimately transmitted to the host country. However, these were liquidity policies that had little to do with credit availability. The supply of credit by foreign banks from the crisis country might take a longer time to return to normal.

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[13]   Our findings are consistent with Peek and Rosengren (1997).

[14]   For example, the average pricing of syndicated loans arranged for Hong Kong's corporations increased markedly since the first half of 2011, from 114 bps over the reference rate, to around 243 bps in July-August 2012, based on authors' calculation.

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Table 1. Descriptive Statistics (in percent)

Based on monthly data of a balanced panel of 89 foreign branches in Hong Kong, 2004 to 2012.

Country of Origin		Liquid Asset/ Total Assets	Net Due From/Total Assets	Total Loans/ Total Assets	Retail deposits/ Total Assets	Wholesale deposits/ Total Assets
Switzerland	Mean	45.76	28.17	23.13	65.33	26.81
	Median	45.62	30.80	21.26	65.71	27.53
	Standard deviation	9.91	24.43	8.71	8.70	6.77
Germany	Mean	24.05	8.04	24.02	17.77	69.93
	Median	20.93	5.39	23.15	13.97	77.09
	Standard deviation	14.20	37.10	14.60	15.43	21.55
Spain and Italy	Mean	16.31	-6.15	24.07	11.11	78.31
	Median	15.60	-6.07	21.37	7.12	80.13
	Standard deviation	6.81	36.87	15.89	11.39	13.27
France	Mean	22.63	1.97	20.72	27.36	56.05
	Median	11.99	9.78	18.53	14.96	58.24
	Standard deviation	24.21	37.02	12.49	32.07	29.80
U.K.	Mean	34.20	7.99	20.07	29.22	49.45
	Median	28.67	10.94	18.83	20.95	49.41
	Standard deviation	27.67	38.94	18.44	23.76	25.39
Japan	Mean	39.18	-27.12	21.56	14.80	77.02
	Median	37.01	-17.18	20.80	7.30	77.01
	Standard deviation	22.38	38.80	14.09	15.07	17.87
U.S.A.	Mean	32.31	25.29	8.71	39.65	48.33
	Median	27.30	28.05	3.34	39.25	46.20
	Standard deviation	21.64	30.01	10.22	22.25	27.09
Other	Mean	24.98	-0.02	30.17	41.62	46.70
	Median	21.74	-1.00	30.08	38.70	47.44
	Standard deviation	15.71	34.04	18.19	28.55	27.78

Table 2. Effects of U.S. Financial Crisis on Foreign Branches in Hong Kong, from Pre-Crisis (period 1) to Onset of Crisis (period 2)

OLS regression estimates of: $\Delta Y_{it} = \alpha_t + \beta_t(Shock_{it}) + \varepsilon_{it}$, where $Shock_{it}$ equals one if the ith foreign branch's parent was from the U.S., zero otherwise.

Dependent Variable (ΔY_{it})		Coefficient Estimate	Standard Error
Percent change in Liquid Assets	Shock	-20.47**	9.12
	Intercept	17.74***	2.58
Change in Net Due to Total Assets	Shock	8.80**	4.00
in percentage points	Intercept	-2.81***	1.06
Percent change in Total Loans	Shock	5.26	15.89
	Intercept	30.10***	4.59
Percent change in Loans for use in	Shock	-7.71	15.26
Hong Kong	Intercept	19.72***	3.96
Percent change in Loans for use	Shock	-4.34	21.50
outside Hong Kong	Intercept	35.66***	5.90
Percent change in Retail Deposits	Shock	15.25	10.14
	Intercept	21.90***	3.09
Percent change in Wholesale	Shock	-5.78	17.35
Deposits	Intercept	36.43***	4.91
Percent change in Total Assets	Shock	0.88	9.41
	Intercept	27.66***	2.82
Change in Liquid Assets to Total	Shock	0.71	1.55
Assets in percentage points	Intercept	-2.21***	0.44
Change in Total Loans to Total	Shock	-1.46	1.53
Assets in percentage points	Intercept	0.51	0.43
Change in Retail Deposits to Total	Shock	0.72	1.89
Assets in percentage points	Intercept	-1.39**	0.53
Change in Wholesale Deposits to	Shock	-0.40	2.01
Total Assets in percentage points	Intercept	1.40**	0.60

***,**,* indicate significance at the 1%, 5%, and 10% level, respectively.

Table 3. Effects of U.S. Financial Crisis on Foreign Branches in Hong Kong, from Pre-TAF (period 2) to Post-TAF, Pre-Lehman Bankruptcy (period 3)

OLS regression estimates of: $\Delta Y_{it} = \alpha_t + \beta_t (\text{Shock}_{it}) + \varepsilon_{it}$, where Shock_{it} equals one if the ith foreign branch's parent was from the U.S., zero otherwise.

Dependent Variable (ΔY_{it})		Coefficient Estimate	Standard Error
Percent change in Liquid Assets	Shock	11.25	9.56
	Intercept	12.69***	3.02
Change in Net Due to Total Assets	Shock	-3.61	3.70
in percentage points	Intercept	-2.97***	1.05
Percent change in Total Loans	Shock	13.35	10.42
	Intercept	18.54***	3.36
Percent change in Loans for use in	Shock	28.30*	15.23
Hong Kong	Intercept	17.91***	4.49
Percent change in Loans for use	Shock	-0.84	11.90
outside Hong Kong	Intercept	23.10***	3.74
Percent change in Retail Deposits	Shock	3.80	10.41
	Intercept	13.38***	3.15
Percent change in Wholesale	Shock	-5.89	14.33
Deposits	Intercept	20.42***	4.30
Percent change in Total Assets	Shock	-2.62	7.76
	Intercept	12.93***	2.33
Change in Liquid Assets to Total	Shock	1.08	1.54
Assets in percentage points	Intercept	-0.72	0.46
Change in Total Loans to Total	Shock	-0.13	1.11
Assets in percentage points	Intercept	1.00***	0.33
Change in Retail Deposits to Total	Shock	0.48	1.65
Assets in percentage points	Intercept	-0.43	0.50
Change in Wholesale Deposits to	Shock	-1.78	2.22
Total Assets in percentage points	Intercept	1.23*	0.67

***,**,* indicate significance at the 1%, 5%, and 10% level, respectively.

Table 4. Effects of U.S. Financial Crisis on Foreign Branches in Hong Kong, from Post-TAF, Pre-Lehman Bankruptcy (period 3) to Post-Lehman Bankruptcy (period 4)

OLS regression estimates of: $\Delta Y_{it} = \alpha_t + \beta_t (Shock_{it}) + \varepsilon_{it}$, where $Shock_{it}$ equals one if the ith foreign branch's parent was from the U.S., zero otherwise.

Dependent Variable (ΔY_{it})		Coefficient Estimate	Standard Error
Percent change in Liquid Assets	Shock	-3.92	12.63
	Intercept	3.67	3.50
Change in Net Due to Total Assets	Shock	-6.47	4.21
in percentage points	Intercept	-1.59	1.23
Percent change in Total Loans	Shock	-5.48	9.02
	Intercept	12.27***	2.71
Percent change in Loans for use in	Shock	3.51	14.82
Hong Kong	Intercept	11.55**	4.54
Percent change in Loans for use	Shock	-6.03	10.30
outside Hong Kong	Intercept	10.44***	3.17
Percent change in Retail Deposits	Shock	-4.94	11.27
	Intercept	2.80	3.35
Percent change in Wholesale	Shock	-11.30	13.49
Deposits	Intercept	6.57*	3.95
Percent change in Total Assets	Shock	5.32	7.38
	Intercept	2.17	2.16
Change in Liquid Assets to Total	Shock	-2.72	2.10
Assets in percentage points	Intercept	-1.22**	0.58
Change in Total Loans to Total	Shock	-1.50	1.63
Assets in percentage points	Intercept	2.24***	0.48
Change in Retail Deposits to Total	Shock	0.03	1.98
Assets in percentage points	Intercept	-0.48	0.58
Change in Wholesale Deposits to	Shock	-2.13	2.63
Total Assets in percentage points	Intercept	-0.03	0.77

***,**,* indicate significance at the 1%, 5%, and 10% level, respectively.

Table 5. Cumulative Effects of U.S. Financial Crisis on Foreign Branches in Hong Kong, from Pre-U.S. Financial Crisis (period 1) to Pre-Euro Zone Debt Crisis (period 5)

OLS regression estimates of: $\Delta Y_{it} = \alpha_t + \beta_t (Shock_{it}) + \varepsilon_{it}$, where $Shock_{it}$ equals one if the ith foreign branch's parent was from the U.S., zero otherwise.

Dependent Variable (ΔY_{it})		Coefficient Estimate	Standard Error
Percent change in Liquid Assets	Shock	-25.29	57.18
	Intercept	66.28***	15.36
Change in Net Due to Total Assets	Shock	3.36	7.13
in percentage points	Intercept	-7.68***	2.04
Percent change in Total Loans	Shock	-116.31*	66.06
	Intercept	88.18***	19.48
Percent change in Loans for use in	Shock	-88.84**	34.04
Hong Kong	Intercept	26.28**	10.15
Percent change in Loans for use	Shock	-4.26	68.27
outside Hong Kong	Intercept	114.84***	21.71
Percent change in Retail Deposits	Shock	136.19*	80.46
	Intercept	72.56***	23.60
Percent change in Wholesale	Shock	-29.96	69.40
Deposits	Intercept	94.92***	21.25
Percent change in Total Assets	Shock	-55.66	98.75
	Intercept	90.45***	24.44
Change in Liquid Assets to Total	Shock	-2.15	3.77
Assets in percentage points	Intercept	-1.54	1.08
Change in Total Loans to Total	Shock	-4.38	2.93
Assets in percentage points	Intercept	2.66***	0.94
Change in Retail Deposits to Total	Shock	5.01	3.97
Assets in percentage points	Intercept	-0.93	1.20
Change in Wholesale Deposits to	Shock	-4.46	4.98
Total Assets in percentage points	Intercept	3.07**	1.51

***,**,* indicate significance at the 1%, 5%, and 10% level, respectively.

Table 6. Effects of European Sovereign Debt Crisis on Foreign Branches in Hong Kong, from Pre-Euro Zone Debt Crisis (period 5) to Pre-LTRO (period 6)

OLS regression estimates of: $\Delta Y_{it} = \alpha_t + \beta_t (\text{Shock}_{it}) + \varepsilon_{it}$, where Shock_{it} equals one if the ith foreign branch's parent was from the euro area, zero otherwise.

Dependent Variable (ΔY_{it})		Coefficient Estimate	Standard Error
Percent change in Liquid Assets	Shock	-16.01	12.06
	Intercept	35.15***	6.73
Change in Net Due to Total Assets	Shock	-5.20	3.62
in percentage points	Intercept	-8.11***	2.13
Percent change in Total Loans	Shock	-61.12**	24.69
	Intercept	116.54***	13.74
Percent change in Loans for use in	Shock	-51.51***	18.87
Hong Kong	Intercept	79.51***	10.76
Percent change in Loans for use	Shock	-102.82**	39.12
outside Hong Kong	Intercept	166.08***	22.44
Percent change in Retail Deposits	Shock	-19.59	13.65
	Intercept	23.88***	7.13
Percent change in Wholesale	Shock	-79.93***	22.59
Deposits	Intercept	103.91***	12.55
Percent change in Total Assets	Shock	-36.38***	11.45
	Intercept	56.27***	6.28
Change in Liquid Assets to Total	Shock	2.22	1.60
Assets in percentage points	Intercept	-3.33***	0.93
Change in Total Loans to Total	Shock	-1.71	2.08
Assets in percentage points	Intercept	7.05***	1.23
Change in Retail Deposits to Total	Shock	3.97***	1.47
Assets in percentage points	Intercept	-6.48***	0.87
Change in Wholesale Deposits to	Shock	-5.34**	2.05
Total Assets in percentage points	Intercept	5.72***	1.21

***,**,* indicate significance at the 1%, 5%, and 10% level, respectively.

Table 7. Effects of European Sovereign Debt Crisis on Foreign Branches in Hong Kong, from Pre-LTRO (period 6) to Post-LTRO (period 7)

OLS regression estimates of: $\Delta Y_{it} = \alpha_t + \beta_t (Shock_{it}) + \varepsilon_{it}$, where $Shock_{it}$ equals one if the ith foreign branch's parent was from the euro area, zero otherwise.

Dependent Variable (ΔY_{it})		Coefficient Estimate	Standard Error
Percent change in Liquid Assets	Shock	-19.30**	7.86
	Intercept	16.41***	4.19
Change in Net Due to Total Assets	Shock	-1.81	2.08
in percentage points	Intercept	2.47**	1.18
Percent change in Total Loans	Shock	-12.53*	6.63
	Intercept	16.94***	3.67
Percent change in Loans for use in	Shock	-14.50*	7.89
Hong Kong	Intercept	9.37**	4.44
Percent change in Loans for use	Shock	-11.13	9.40
outside Hong Kong	Intercept	23.36***	5.30
Percent change in Retail Deposits	Shock	-8.88	10.13
	Intercept	18.13***	5.39
Percent change in Wholesale	Shock	-23.03***	7.02
Deposits	Intercept	8.97**	3.88
Percent change in Total Assets	Shock	-17.63***	4.81
	Intercept	10.79***	2.64
Change in Liquid Assets to Total	Shock	-0.60	0.87
Assets in percentage points	Intercept	0.29	0.50
Change in Total Loans to Total	Shock	2.36*	1.28
Assets in percentage points	Intercept	1.41*	0.75
Change in Retail Deposits to Total	Shock	1.36	1.13
Assets in percentage points	Intercept	0.14	0.66
Change in Wholesale Deposits to	Shock	-2.93**	1.41
Total Assets in percentage points	Intercept	-0.59	0.81

***,**,* indicate significance at the 1%, 5%, and 10% level, respectively.

Figure 1. 3-Month Libor-OIS Spread, Daily, 2005 to 2013

3-month Libor-OIS Spread
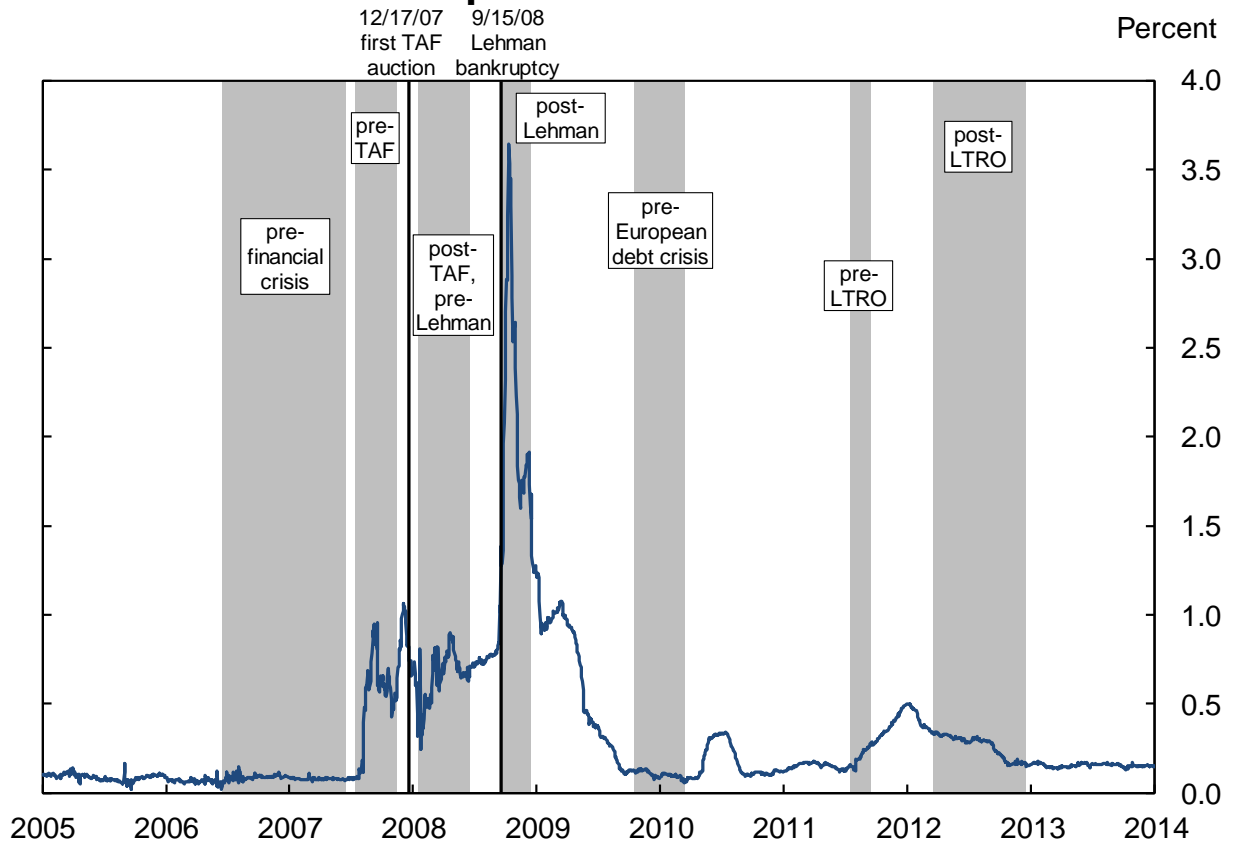
Source: Bloomberg

The shaded bars denote the following time periods:

Period 1: 2006:7 to 2007:6 (pre-US financial crisis)

Period 2: 2007:7 to 2007:11 (pre-TAF)

Period 3: 2008:1 to 2008:6 (post-TAF, pre-Lehman bankruptcy)

Period 4: 2008:9 to 2008:12 (post-Lehman bankruptcy)

Period 5: 2009:10 to 2010:3 (pre-euro zone debt crisis)

Period 6: 2011:7 to 2011:9 (pre-LTRO)

Period 7: 2012:3 to 2012:12 (post-LTRO)

Figure 2. 5-Year Credit Default Swap Spreads on Sovereign Debts of Euro Area Countries

Eurozone Sovereign 5-year CDS Spreads
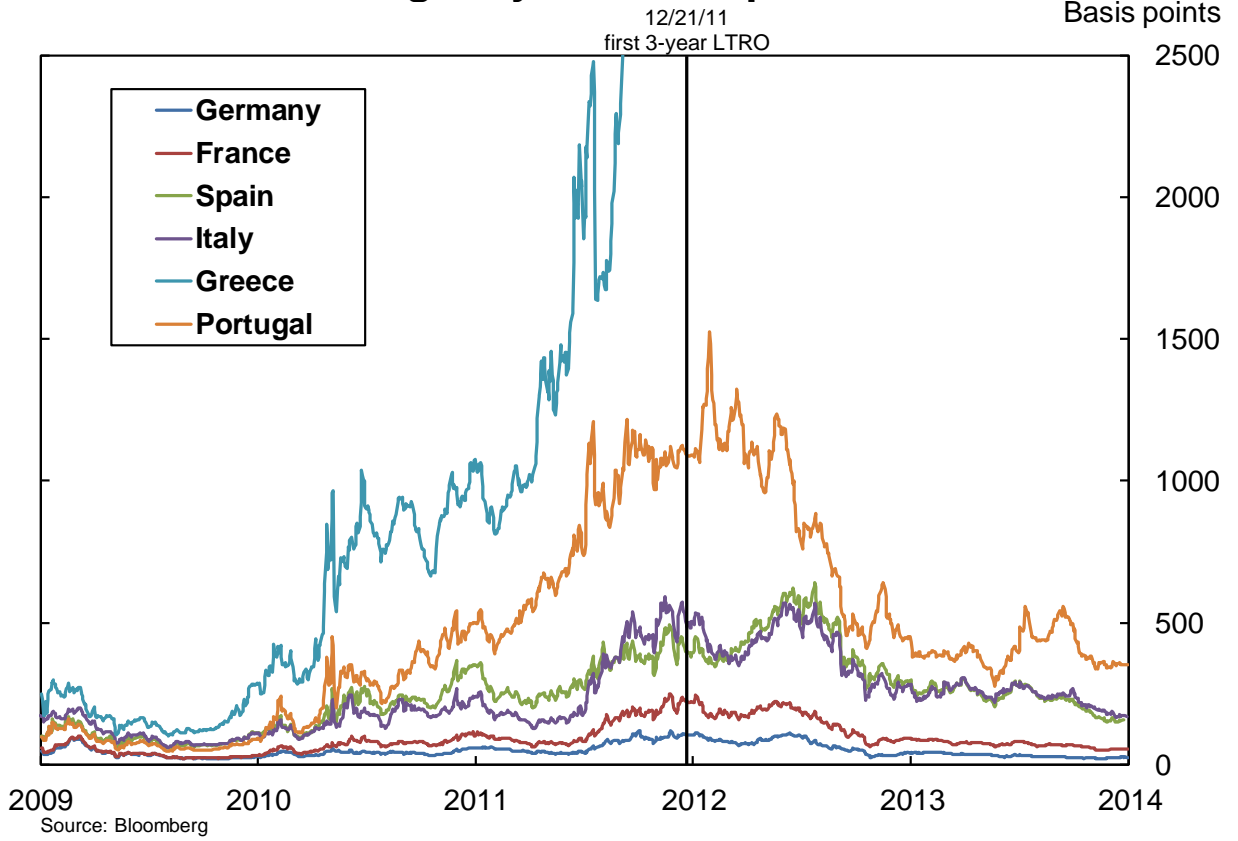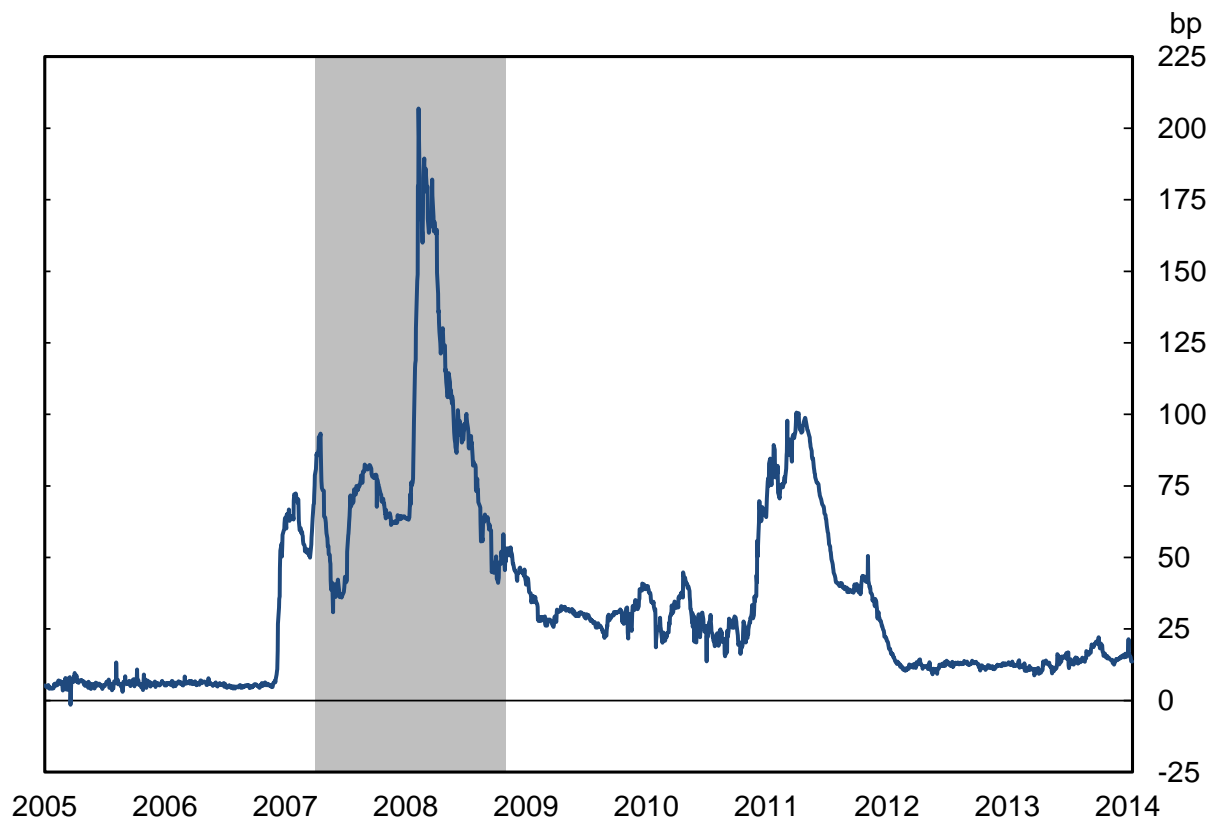
Source: Bloomberg

Figure 3. 3-Month Euribor-Eonia Spread, Daily, 2005-2013

3-month Euribor-EONIA Spread

Source: Bloomberg

The shaded bar denotes the NBER Recession in the U.S.